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(54) Coin chute for use in payphone instruments.

(57) To make the most efficient use of space, in for example, a telephone coin-box instrument, the coin runway requires to be folded back-upon itself. This requires that the direction of motion of the coin in the runway is reversed without creating a potential coin jamming situation. The coin runway consists of two sections (8,9) interconnected by the direction changing area. Under the action of gravity a coin (10) rolls down the upper coin runway (8) and strikes an impact face (12) in the direction changing area. The impact face (12) incorporates a material which has a low coefficient of restitution to restrict the coin rebound. The direction changing area also includes a downward inclined connecting surface (13), and as the coin rebounds, it slides down the connecting surface into the lower coin runway (9). In a modified version of the arrangement the step down area (15) is of sufficient size to be included as part of a coin store, and the floor of the arrangement is angled (16) to prevent coin blocking.

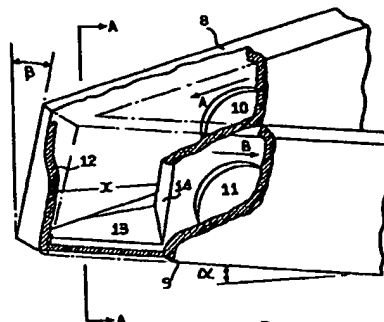


Fig. 2

COIN CHUTE FOR USE IN PAYPHONE INSTRUMENTS

The present invention relates to coin-chutes particularly although not exclusively, for use in telephone coin-box instruments known also as payphones.

A major problem in such payphones is the efficient utilisation of the available space by the apparatus which is housed within the device.

Accordingly it is an object of this invention to provide a coin chute which is adapted to make the most efficient use of space within the payphone while maintaining an efficient operation in the presence of coins.

According to the present invention, there is provided a coin chute comprising first and second runways each adapted for the passage of coins by means of gravity in which the first runway is adapted to be connected at one of its ends to the second runway at one of its ends in such manner, whereby when a coin is placed in the first runway, it rolls freely along this runway in a first direction and upon reaching the point of connection of the two runways is adapted to enter the second runway whereupon it rolls freely along this runway in a second direction.

The invention will be more readily understood from the following description of two exemplary embodiments which should be read in conjunction with the accompanying drawings in which:-

Fig. 1. Shows a view of part of a payphone, portions of which are cut away to illustrate the positioning of a

typical coin chute within the payphone;

Fig. 2. shows the relevant portions of a coin-chute in accordance with the present invention with certain sections of the walls of the chute cut-away to enable the internal features to be observed;

Fig. 3. shows a section of the chute as shown in Fig. 2 as viewed in the direction of the arrows of section A - A; and,

Fig. 4. shows a further view of the coin-chute in accordance with this invention but with a modification to incorporate a coin store (the walls of the chute are cut-away to enable observation of the internal features).

Referring to Fig. 1. which shows a typical coin-chute 1 located within a payphone. The chute 1 has associated with it coin detection mechanisms such as coin reject 2, validator 3, flushing 4 and cash box/refund 5. A coin store 6 and a refund draw 7 are shown at the lower part of the instrument.

Referring now to Fig. 2. to Fig. 4. of the drawings, it will be seen that the chute comprises a first upper runway 8 and a second lower runway 9. Both runways are inclined to the horizontal by an angle α to enable coins 10 and 11 to pass along and down the runways under the action of gravity.

A coin 10 in the upper runway moves in a first direction of motion A, whereas a coin 11 in the lower runway moves in a second direction of motion B. In effect the coin travelling down the coin chute has a reversal in direction of motion.

The change in direction of motion has to be carefully controlled and is achieved at the junction of the upper and lower runway by means of a specially designed impact face 12 and a connecting surface 13 between both coin runways.

As explained, under the action of gravity a coin entering the upper runway 8, rolls down the runway and strikes the impact face 12. This impact face 12 has a low coefficient of restitution to restrict the coin rebound and accordingly as the coin's controlled rebound takes effect, the coin slides down an inclined connecting surface 13 into the lower runway 8. The coin now rolls down this runway also under the action of gravity.

The material used at the impact face 12 must exhibit a high mechanical hysteresis and an example of such a material is Neoprene rubber. This can be bonded to a backing material which can be an integral part of the runway moulding. Alternatively a soft P.V.C. can be used, coated on Aluminium, or even a loose fitting insert of plastics or metal exhibiting pendulum damping, may be used.

It is important to note that the rebound dimension x, between the impact face 12 and face 14 of the joining inside walls of the two runways, is defined by the following formula:-

$$X_{\text{minimum}} = \frac{(e V)^2}{2g (\sin \alpha + \mu \cos \alpha)}$$

where e = coefficient of restitution

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μ = coefficient of friction
 V = velocity of impact
 g = acceleration due to gravity
 α = runway angle

5 This formula is derived as follows:-

At the instant of rebound of the coin, it should be assumed that the velocity is equal to V_1 and that it reduces to zero through a rebound distance x .

10 Now, the retarding force of the coin = mass \times acceleration. If also it is assumed that w is the weight of the coin perpendicularly downwards on the runway, which is inclined at an angle α to the horizontal, and μ is the coefficient of friction, then

$$W \sin \alpha + \mu W \cos \alpha = \frac{W}{g} \times \text{acceleration}$$

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where g is the acceleration of the coin due to gravity

$$\therefore \text{acceleration} = g (\sin \alpha + \mu \cos \alpha)$$

$$\text{by substitution, } \frac{V_1^2}{2x} = g (\sin \alpha + \mu \cos \alpha)$$

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$$\therefore x = \frac{V_1^2}{2g (\sin \alpha + \mu \cos \alpha)}$$

If velocity = V and the coefficient of restitution of the impact face = e

$$\text{then } V = eV$$

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$$\text{and } x = \frac{(eV)^2}{2g (\sin \alpha + \mu \cos \alpha)}$$

As previously stated.

The angle β that the chute takes up from the vertical, is

necessary to ensure that coins passing down the runways remain in abutment with one of the runway walls only. This is to enable correct detection of the passage of coins by coin detection mechanisms adjacent these walls.

5 In the modified coin-shute shown in Fig. 4. there is provided a step-down area 15 of sufficient size to accommodate a certain number of coins to enable a degree of coin-storage. It will be seen that the floor of the lower runway 16 from the impact face 12 is a steeper angle
10 than the lower runway itself. This is to prevent coin blockage.

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WHAT WE CLAIM IS:-

1. A coin chute comprising first and second runways each adapted for the passage of coins by means of gravity in which the first runway is adapted to be connected at one of its ends to the second runway at one of its ends, in such manner, whereby when a coin is placed in the first runway, it rolls freely along this runway in a first direction and upon reaching the point of connection of the two runways is adapted to enter the second runway, whereupon it rolls freely along the runway in a second direction.
2. A coin chute as claimed in claim 1, in which at the point of connection of the first and second runways there is located a coin impact face which exhibits a high mechanical hysteresis and which controls the coin rebound by the material employed which has a low coefficient of restitution.
3. A coin chute as claimed in claim 2, in which the said material is NEOPRENE (Registered Trade Mark) which is bonded to a backing material and which forms an integral part of the coin chute runways.
4. A coin chute as claimed in claim 2, in which the said material is a loose fitting insert of plastic or metal exhibiting pendulum damping.
5. A coin chute as claimed in claim 2, in which said material is aluminium coated polyvinyl chloride (P.V.C.).
6. A coin chute as claimed in claim 2, in which at the point of connection of the first and second runways, there

is an inclined connecting surface down which the coin slides when moving from the first runway to the second runway.

7. A coin chute as claimed in any preceding claim, in which the first and second runways are inclined to the horizontal by an acute angle α .

8. A coin chute as claimed in any preceding claim, in which the coin chute is inclined from the vertical by an acute angle β to ensure that coins moving down said first and second runways remain in abutment with one of the runway walls.

9. A telephone coin box instrument incorporating a coin chute as claimed in any preceding claim.

10. A coin chute as claimed in any one of claims 6 to 9 in which at the point of connection of the first and second runways and adjacent the inclined connecting surface there is provided a step-down area for coin storage.

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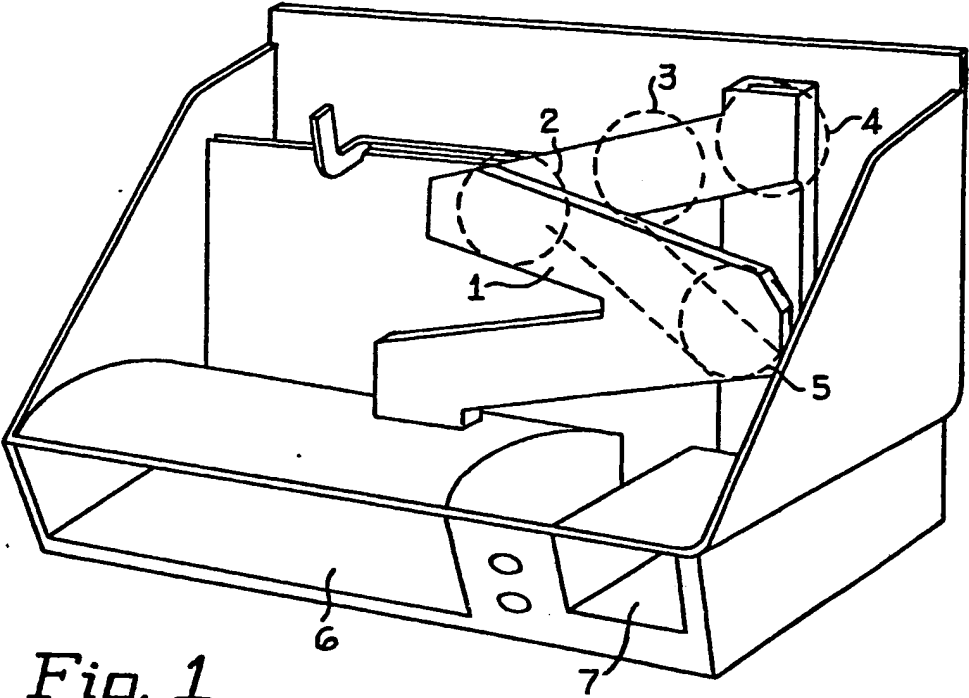


Fig. 1

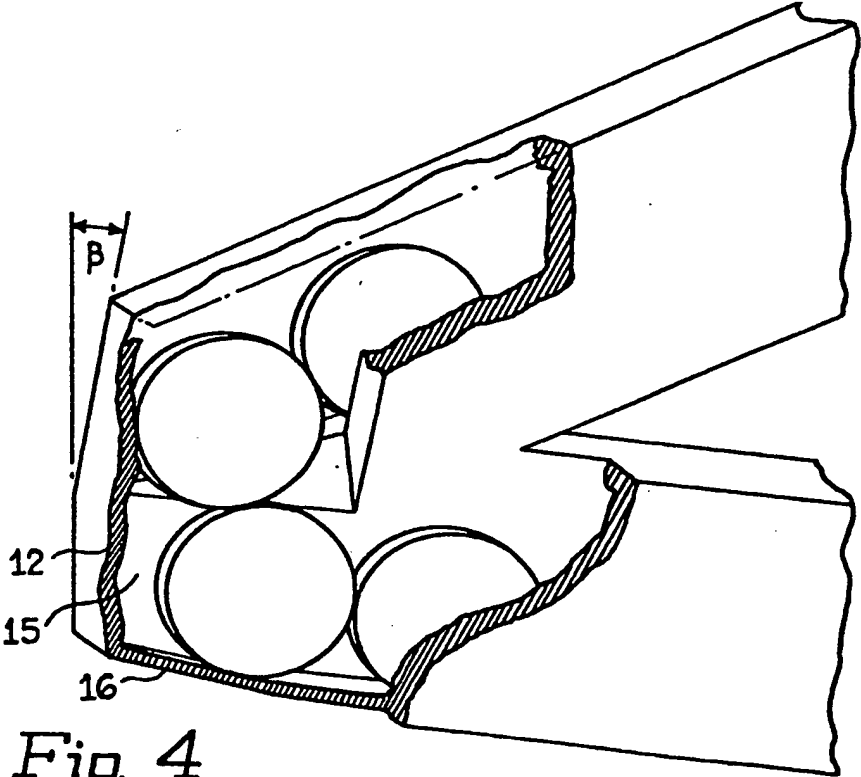


Fig. 4



European Patent
Office

EUROPEAN SEARCH REPORT

0042662
Application number
EP 81 30 1411

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<p><u>FR - A - 790 014 (LESAGE)</u></p> <p>* Page 1, lines 1-40; page 2, lines 22-44; figure 1 *</p> <p>--</p> <p><u>US - A - 2 151 823 (TRATSCH)</u></p> <p>* Page 2, lines 14-16; figure 4 *</p> <p>--</p> <p><u>US - A - 3 889 792 (WILLIS)</u></p> <p>* Whole document *</p> <p>--</p> <p><u>US - A - 2 050 678 (WEBER)</u></p> <p>* Page 1, lines 51-56; figure 1 *</p> <p>--</p> <p><u>US - A - 2 160 751 (MILLS)</u></p> <p>* Page 1, column 2, line 51 - page 2, column 2, line 2; figures 1-5 *</p> <p>--</p> <p><u>US - A - 1 945 740 (EDISON)</u></p> <p>* Page 2, column 1, line 66 - column 2, line 106; figures 1-4 *</p> <p>--</p> <p><u>US - A - 2 343 352 (WEILER)</u></p> <p>* Page 6, column 1, lines 40-71* figures 1,9 *</p> <p>----</p>	<p>1,7,10</p> <p>1,2,7</p> <p>1-4</p> <p>1,2</p> <p>1,2,7</p> <p>1,7,8</p> <p>1,6</p>	<p>G 07 F 1/04 G 07 F 3/00</p> <p>TECHNICAL FIELDS SEARCHED (Int. Cl.)</p> <p>G 07 F 1/00 1/02 1/04 3/00 3/02 G 07 D 3/04 5/00 5/04 5/06</p> <p>CATEGORY OF CITED DOCUMENTS</p> <p>X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons</p> <p>&: member of the same patent family, corresponding document</p>
<p>X The present search report has been drawn up for all claims</p>			
Place of search	Date of completion of the search	Examiner	
The Hague	10-08-1981	RUDOLPH	